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Ogden, Utah

Forest Insect and Disease Conditions in the Intermountain Region, 1994

FOREST INSECT AND DISEASE CONDITIONS

in the

Intermountain Region

1994

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INTRODUCTION

This report summarizes the status of insect and disease pests of forest trees in the Intermountain Region. Status of insects is based largely on annual and special aerial detection surveys which are conducted over 14,000,000 acres of forested lands. Status of diseases is based largely on ground observations and surveys.

General insect and disease information is summarized in the Résumé of Conditions.

Numbers of trees killed by major bark beetles and acreage of defoliating insect activity are displayed in Tables 1 through 9. Figure 1 displays the number of trees killed by bark beetles in Region 4 between 1981 and 1994. Figure 2 displays the number of acres defoliated by Douglas-fir tussock moth and western spruce budworm in Region 4 between 1960 and 1994. Estimates are based on aerial survey information. General location of major insect activity is shown in Figures 3 through 7.

The Special Project Update summarizes on-going studies being conducted by Forest Pest Management.

Recent publications are listed to aid the reader in locating specific, recent pest information of interest.

RÉSUMÉ OF CONDITIONS

Mountain pine beetle activity in ponderosa pine decreased in southern Idaho, Utah, and Wyoming. In 1993, 53,700 trees were killed while in 1994, 24,200 dying trees were reported. The largest outbreaks are located on the Dixie, Fishlake, and Manti-LaSal National Forests in Utah, and on the Sawtooth National Recreation Area and Salmon National Forest in southern Idaho. Static levels of mountain pine beetle activity were noted throughout the Region.

Spruce beetle activity decreased in Idaho and increased in Utah. Regionwide, 45,200 trees were killed in 1994 compared to 58,200 in 1993. Decreases in tree mortality in Idaho were attributed to decreases in host type due to past outbreaks and extensive wildfire. Significant increases in activity occurred on the Manti-LaSal and Fishlake National Forests in Utah.

Douglas-fir beetle activity decreased from past levels with 54,500 trees killed in 1994 compared to 98,900 trees in 1993. Significant decreases in activity occurred in Idaho, while activity remained static in Utah and western Wyoming. The largest outbreaks are located on the Boise, Sawtooth, and Payette National Forests in Idaho, and on the Uinta and Wasatch-Cache National Forests in Utah.

Western pine beetle activity decreased from 18,500 trees killed in 1993, to 6,300 trees in 1994. Activity is located primarily on the Boise National Forest in southern Idaho. Pine engraver beetle activity was frequently associated with western pine beetle infestation.

A complex of western balsam bark beetle attack and disease pathogens continues to damage and kill subalpine fir throughout the Region. Mortality levels declined in 1994 with 272,900 dying trees observed, while in 1993, 391,100 trees were killed. Mortality is located throughout the host type and appears to afflict trees of all size classes. Widespread mortality was located in southern Idaho, Utah, and western Wyoming.

Fir engraver beetle activity decreased in Idaho and Nevada, and increased in Utah. Regionwide, 180,500 true fir trees were killed in 1994 compared to 394,700 trees in 1993. Much of this decrease in activity was attributed to a decline in activity on the Boise and Payette National Forests in Idaho. Large outbreaks are located on the Toiyabe National Forest in Nevada, and the Uinta National Forest in Utah.

No significant defoliator activity was observed during 1994. This is the first time since surveys were initiated in the early 1960's in which no defoliator activity was recorded.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Cooley spruce gall adelgid *Adelges cooleyi*	Spruce	Idaho Utah Wyoming	This adelgid was found in forested stands and ornamental trees throughout the Region; impact was probably greatest in ornamental trees.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho Utah Wyoming	Regionwide mortality decreased with 56,500 trees killed in 1994, a two-fold decrease from 1993. Outbreaks were located on the Boise, Caribou, Sawtooth, and Payette National Forests. In Utah, tree mortality remained static with 6,700 trees killed in 1993 and 6,000 trees killed in 1994. The largest outbreaks are located on the Uinta and Wasatch-Cache National Forests. Smaller outbreaks are located on other National Forests in Utah. The Bridger-Teton National Forest in western Wyoming remained static with 6,600 trees killed in 1993 and 6,400 trees killed in 1994.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir, True firs	Idaho Utah	In 1992, Douglas-fir tussock moth populations collapsed. No defoliation was observed in 1994.
European gypsy moth *Lymantria dispar*	Various deciduous species	Utah	This was the sixth year of the Utah Gypsy Moth Eradication Project. No insecticide treatment was done in 1994. One moth was caught in the Salt Lake Valley. One other moth was caught in the Region.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Fir engraver beetle *Scolytus ventralis*	Grand fir, White fir, Red fir, Subalpine fir	Idaho Nevada Utah Wyoming	Decreases in fir engraver beetle activity were observed in Nevada and Idaho, while increases were observed in Utah. Regionwide, 394,700 trees were killed in 1993 compared to 180,500 trees in 1994. In Idaho, significant decreases in activity occurred on the Boise and Payette National Forests, and on adjacent State and private lands. Only 4,400 trees were killed in southern Idaho in 1994 compared to 67,200 trees in 1993. Conversely, in Utah fir engraver beetle activity increased with 86,600 trees killed in 1994 compared to 45,100 trees killed in 1993. Most activity was located on the Uinta National Forest where 76,100 dead trees were observed. Elsewhere, mortality was observed on the Dixie, Fishlake, Manti-LaSal, and Wasatch-Cache National Forests. In Nevada, activity decreased from 281,000 trees killed in 1993 to 89,500 killed in 1994. Mortality is located primarily on Federal, State, and private lands in the Tahoe Basin area and adjacent areas of the Toiyabe National Forest. Fir engraver beetle activity was not observed on the Bridger-Teton National Forest in western Wyoming.
Jeffrey pine beetle *Dendroctonus jefferyi*	Jeffrey pine	Nevada	Jeffrey pine beetle activity declined on the Toiyabe National Forest with 11,800 trees killed. Significant tree mortality continues to occur in the Tahoe Basin area on Forest Service, State, and private lands. Less widespread activity is present throughout other areas on the Toiyabe National Forest.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine,	Idaho Utah Wyoming	Trees killed by mountain pine beetle attack decreased from 44,600 in 1993 to 24,200 trees in 1994. In Utah, 19,100 trees were killed during 1994, while 11,500 trees were killed in 1993. Most mortality occurred in ponderosa pine. The largest outbreak is located on the Dixie National Forest where 11,600 trees were killed. Smaller outbreaks were located on all other National Forests in Utah. In Idaho, a significant reduction in activity occurred with only 4,800 trees killed in 1994 compared to 41,300 during 1993. Mortality occurred in both lodgepole and ponderosa pine. Decreases occurred on all National Forests except the Caribou National Forest, where tree mortality remained static. The largest outbreak in southern Idaho continues to be located in the Sawtooth National Recreation Area on the Sawtooth National Forest. On the Bridger-Teton National Forest in western Wyoming, tree killing by mountain pine beetle decreased with only 300 trees observed in 1994. The cool, wet weather of 1993 evidently affected beetle populations in 1994. Attacks were reported a month earlier than expected in 1994 indicating that adults successfully over wintered in 1993-94.
Mountain pine beetle *Dendroctonus ponderosae*	Whitebark pine	Idaho Nevada Utah Wyoming	Decreases in whitebark pine mortality attributed to mountain pine beetle activity occurred Regionwide during 1994. Small, isolated infestations are located on National Forests in Idaho and on the Bridger-Teton National Forest in western Wyoming.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Oyster shell scale *Lepidosaphes ulmi*	Cottonwood, Aspen, Willow	Utah	Light to moderate populations of this insect, infesting cottonwoods and aspen, were located in Ranch Canyon on the Bureau of Land Management, Beaver Resource Area near Milford, Utah. Heavy populations were infesting approximately 20 acres of coyote willow in the Vernon Creek and Little Valley campgrounds on the Spanish Fork Ranger District of the Uinta National Forest.
Pine engraver beetle *Ips pini*	Lodgepole pine, Ponderosa pine	Idaho Nevada Utah	Increases of ground detection's of pine engraver beetle occurred on the Boise and Payette National Forests in southern Idaho. Activity is often associated with western pine beetle. In Utah, populations were found in slash of ponderosa and lodgepole pine.
Satin moth *Leucoma salicis*	Poplars, Willows	Idaho	Heavy defoliation of willows and poplars was reported along Moore's Creek near Idaho City and in Rexburg.
Spruce beetle *Dendroctonus rufipennis*	Spruce	Idaho Utah Wyoming	Mortality from spruce beetle infestation decreased during 1994 with 45,200 trees killed compared to 58,200 in 1993. This decrease was attributed to a decline in host type on the Payette National Forest due to recent outbreaks and extensive wildfire in infested areas. No significant mortality was reported on any other forests in southern Idaho. In Utah where 35,700 trees were killed, activity increased on the Fishlake and Manti-LaSal National Forests and decreased on the Dixie National Forest. No significant mortality was observed on the Bridger-Teton National Forest in western Wyoming.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Western balsam bark beetle *Dryocoetes confusus*	Subalpine fir	Idaho Utah Wyoming	A complex of western balsam bark beetle and disease pathogens resulted in the death of 272,900 trees throughout the Region. Currently, this mortality complex is the most widespread cause of visible mortality in the Region. In Idaho, 61,100 trees were killed during 1994 compared to 141,100 trees in 1993. Large areas of mortality are located on the Boise, Caribou, Payette, and Targhee National Forests. In Utah, activity increased with 157,300 trees killed in 1994. Extensive mortality was observed on every forest except the Ashley. Activity decreased in western Wyoming with 54,500 trees killed in 1994 compared to 124,300 trees in 1993.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Significant decreases in western pine beetle activity occurred on the Boise, Payette, and Sawtooth National Forests in southern Idaho. Approximately 6,300 trees were killed in 1994 compared to 18,500 in 1993. Pine engraver beetle activity was frequently associated with western pine beetle infestation.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, True firs	Idaho	For the first time since the early 1960's, no visible defoliation from western spruce budworm was observed anywhere in the Region.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Aspen trunk rot *Phellinus tremulae*	Aspen	Idaho Nevada Utah Wyoming	Decay occurs in most aspen stands in the Region and is increasingly common as aspen stands exceed 80 years of age.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Idaho Utah Wyoming	Infection occurs infrequently throughout Idaho and Utah. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in southern Idaho. In Wyoming and northern Utah, infection frequently occurs on lodgepole pine in localized pockets.
Pinyon blister rust *Cronartium occidentale*	Pinyon pine	Idaho Utah	This disease occurs on the Moab Ranger District, Manti-LaSal National Forest, Utah, and in the Raft River Mountains on the Sawtooth National Forest, Idaho.
Cytospora canker of true firs *Cytospora abietis*	True firs	Idaho Utah Wyoming	Branch flagging, top-killing, and mortality attributed to this fungus occurred in localized areas throughout host type. This disease was frequently found occurring with western balsam bark beetle attacks.
Canker of subalpine fir (*Pleurocytospora*-like)	Subalpine fir	Idaho	Branch flagging, top-killing, and mortality attributed to this fungus occurred in localized areas throughout host type. Infection levels declined in southern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Dwarf mistletoes *Arceuthobium spp.*	Douglas-fir, Lodgepole pine, Ponderosa pine, Whitebark pine, Western larch, Jeffrey pine, True firs	Idaho Nevada Utah Wyoming	Suppression projects continue to remove infected overstory trees; however this forest disease remains the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is as follows: lodgepole pine = 45% infected, ponderosa pine = 25% infected, and Douglas-fir = 33% infected.
True mistletoe on Juniper *Phoradendron juniperinum*	Junipers	Nevada Utah	This pest occurs on juniper on the Fishlake and Dixie National Forests in Utah and in Great Basin National Park in Nevada.
Limb rust *Peridermium filamentosum*	Ponderosa pine	Utah	Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.
Red ring rot *Phellinus pini*	Western larch, True firs, Spruce, Douglas-fir, Pines	Idaho Utah Wyoming	Infection intensity varies throughout stands in the Region.
Rust-red stringy rot *Echinodontium tinctorium*	Grand fir, White fir, Subalpine fir	Idaho Nevada Utah	Decay caused by this fungus is common in mature and overmature stands of true firs.
Stalactiform blister rust *Cronartiumn coleosporiodes*	Lodgepole pine	Idaho Nevada Utah	This rust occurs in localized areas throughout the host type. Heavy infection has been noted in localized areas on the Boise, Payette, Sawtooth, Challis, and Targhee National Forests in Idaho.
Other stem decays: *Cryptoporus volvatus* *Fomitopsis officinalis* *Polyporous sulphureus*	Various conifers	Idaho Nevada Utah Wyoming	A large number of minor stem decay agents, too numerous to list, occur with varying intensity throughout the Region.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Idaho Utah Wyoming	Gall rust occurs extensively throughout the host types. Varied infection levels are observed with localized heavy infection levels present in both host species.
White Pine blister rust *Cronartium ribicola*	Whitebark pine	Idaho	White pine blister rust occurs infrequently in southern Idaho because of the widely scattered host. High levels of infection in localized areas result in branch, top, and entire tree mortality of hosts.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Douglas-fir, Engelmann spruce, Lodgepole pine, Ponderosa pine, Jeffrey pine, True firs, Bitterbrush, Chokecherry.	Idaho Nevada Utah Wyoming California	Infection causes varying amounts of root and butt rot in mature individuals of many tree species, and may result in predisposition to windthrow and/or beetle attack. In grand fir and subalpine fir, it is commonly found as a butt rot. Infection-induced mortality occurs occasionally in young ponderosa pine and seldom in other hosts.
Armillaria root disease *Armillaria* sp.	Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir	Idaho Nevada Utah Wyoming	Evidence of Armillaria root disease can be found throughout the Region. In southern Idaho, northern Utah, Nevada, and Wyoming, it functioned primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen killing mature and immature ponderosa pine and mature fir and spruce.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
White mottled rot *Ganoderma applanatum*	Aspen	Idaho Nevada Utah Wyoming	This pathogen is commonly observed in association with windthrown aspen on the Dixie, Wasatch-Cache, and Fishlake National Forests in Utah; Humboldt National Forest in Nevada; and Caribou and Sawtooth National Forest in Idaho.
Black stain root disease *Ophiostoma wageneri, (=Ceratocystis wagenerii)*	Pinyon pine	Idaho Nevada Utah	This fungus causes mortality of Pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forests in Utah.
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, Ponderosa pine	Idaho	Decay is common in mature and overmature forests throughout the host type, especially those having a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity. Trees are seldom killed directly as a result of infection.
Tomentosus root disease *Inonotus tomentosus*	Douglas-fir, Spruce, Subalpine fir	Idaho Utah	This fungus is found alone or associated with *Phaeolus schweinitzii* and *Armillaria spp.* It causes root and butt rot of pole-sized and larger trees predisposing trees to bark beetle attack and windthrow in southern Idaho. In southern Utah, it kills spruce in progressively enlarging disease centers.
Foliage Diseases			
Conifer - Aspen rust **Conifer - Cottonwood rust** *Melampsora medusae* *Melampsora occidentalis*	Aspen, Conifers, Cottonwood	Idaho	Infected cottonwood and aspen were commonly observed in southern Idaho. Some aspen clones were severely defoliated by these fungi. Limited infection of the alternate host conifers was confirmed.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Douglas-fir needle cast *Rhabdocline* spp.	Douglas-fir	Idaho	Incidence was light with infection noted throughout the range of Douglas-fir in southern Idaho.
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho	Systemic and annual infections occur throughout the host type. Infection was especially severe in southwestern Idaho. Foliage discoloration caused by this fungus increased in 1994.
Incense cedar broom rust *Gymnosporangium libocedri*	Incense cedar	California Nevada	This disease occurs in isolated patches of host trees on the Toiyabe National Forest in Nevada and California.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Idaho Nevada Utah Wyoming	Infections occur throughout the host's range. Infection intensity varies significantly, but is pandemic in stands south of the Snake River in Idaho.
Fir needle cast *Lirula* spp.	Subalpine fir, Grand fir	Idaho	Infection occurred at endemic levels throughout the host type.
Fir needle rust *Pucciniastrum epilobii*	Subalpine fir	Idaho Wyoming	Scattered infection occurs on seedling and sapling size trees throughout the host type.
Larch needle blight *Hypodermella laricis*	Western larch	Idaho	Incidence and severity of infection in west central Idaho was light. Detection is usually confounded by frost damage that occurs shortly after spring needle flush.
Larch needle cast *Meria laricis*	Western larch	Idaho	Incidence and severity of infection in west central Idaho is cyclical. Detection is confounded by frost damage that occurs shortly after spring needle flush.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Lodgepole pine needle cast *Lophodermella concolor*	Lodgepole pine	Idaho	Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.
Shepherd's crook *Venturia macularis*	Aspen	Idaho Utah	Scattered incidence of light to moderate intensity was noted in southern Idaho and throughout Utah.
Spruce broom rust *Chrysomyxa arctostaphylii*	Engelmann spruce	Idaho Utah Wyoming	Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.
Pine needle rust *Colesporium* spp.	Ponderosa pine, Lodgepole pine	Idaho	Scattered incidence of light to moderate intensity occurred scattered throughout the host types in southern Idaho.
Nursery Diseases			
Fusarium root disease *Fusarium oxysporum*	True firs, Douglas-fir, Ponderosa pine	Idaho Utah	This disease causes small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho and the Lone Peak Nursery in Utah.
Phytophthora/ Pythium root rot *Phytophthora* spp., *Pythium* spp.	Douglas-fir, Spruce	Idaho Utah	These fungi occur infrequently on seedlings and in soil at the Lucky Peak Nursery, Boise National Forest, Idaho, and the Lone Peak Nursery in Utah. Infection results in patch mortality and culling of 2-0 seedlings.
Abiotic			
Drought effects	All vegetation	Regionwide	Premature needle drop, leaf scorch, and seedling mortality were observed due to seven out of eight years of below normal precipitation in the Intermountain Region.

TABLE 1.--*Number of trees killed and acres infested by bark beetles on National Forests of Region 4 during 1994 as determined by aerial detection surveys.*

	Mountain Pine Beetle		Douglas-fir Beetle		Western Pine Beetle/*Ips*		Spruce Beetle		Fir Engraver Beetle		Western Balsam Bark Beetle		Jeffrey Pine Beetle		Totals	
Forest*	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley	300	900	200	100	--	--	--	--	--	--	700	300	--	--	1,200	1,300
Boise	100	100	18,100	15,300	3,000	3,000	--	--	500	1,400	3,200	4,800	--	--	24,900	24,600
Bridger-Teton	300	400	6,400	4,100	--	--	--	--	--	--	54,100	27,800	--	--	60,800	32,300
Caribou	--	--	1,500	900	--	--	--	--	--	--	12,100	4,900	--	--	13,600	5,800
Challis	500	400	200	100	--	--	--	--	--	--	700	500	--	--	1,400	1,000
Dixie	11,600	11,600	--	--	--	--	3,900	2,000	3,500	1,500	22,200	16,900	--	--	41,200	32,000
Fishlake	2,000	1,600	--	--	--	--	1,200	1,700	2,000	1,800	36,900	25,500	--	--	42,100	30,600
Manti-LaSal	1,900	1,800	600	300	--	--	29,800	9,700	2,000	2,100	22,500	17,100	--	--	56,800	31,000
Payette	--	--	4,000	2,200	1,100	900	8,700	4,600	--	--	1,400	1,000	--	--	15,200	8,700
Salmon	2,000	2,200	1,400	1,000	--	--			--	--	500	400	--	--	3,900	3,600
Sawtooth	1,300	900	16,800	13,900	300	400	--	--	--	--	26,700	23,100	--	--	45,100	48,300
Targhee	--	--	1,300	900	--	--	--	--	--	--	3,800	2,100	--	--	5,100	3,000
Toiyabe	--	--	--	--	--	--	--	--	86,900	30,000	--	--	11,000	9,200	97,900	39,200
Uinta	1,200	200	2,900	3,300	--	--	--	--	76,100	27,000	44,500	30,500	--	--	124,700	61,000
Wasatch-Cache	1,800	2,200	2,300	1,200	--	--	--	--	1,400	1,900	20,200	16,000	--	--	25,700	21,300
TOTAL	23,000	22,300	55,700	43,300	4,400	4,300	43,600	18,000	172,400	65,700	249,500	170,900	11,000	9,200	559,600	333,700

***Does not include all BLM, Tribes of the Indian Nations, state and private lands adjacent to Forest.**

TABLE 2.---*Status of mountain pine beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	3.6	3.9
Other Federal	0.0	0.0
State and Private	0.7	0.9
TOTAL	4.3	4.8

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	18.3	18.8
Other Federal	0.0	0.0
State and Private	0.4	0.3
TOTAL	18.7	19.1

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.4	0.3
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.4	0.3

TABLE 3.---*Status of spruce beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	4.6	8.7
Other Federal	0.0	0.0
State and Private	1.4	0.8
TOTAL	6.0	9.5

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	13.4	34.9
Other Federal	0.0	0.0
State and Private	1.0	0.8
TOTAL	14.4	35.7

TABLE 4.---*Status of Douglas-fir beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	34.3	43.3
Other Federal	0.1	0.1
State and Private	0.9	0.6
TOTAL	35.3	44.1

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	4.9	6.0
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	4.9	6.0

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	4.1	6.4
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	4.1	6.4

TABLE 5.---*Status of western pine beetle/Ips beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	4.3	4.4
Other Federal	0.0	0.0
State and Private	2.9	1.9
TOTAL	7.2	6.3

TABLE 6.---*Status of Jeffrey pine beetle infestations by state during 1994.*

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	9.2	11.0
Other Federal	0.0	0.0
State and Private	0.7	0.8
TOTAL	9.9	11.8

TABLE 7.---*Status of western balsam bark beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	36.8	48.4
Other Federal	2.0	8.8
State and Private	9.6	3.9
TOTAL	48.4	61.1

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	106.3	147.0
Other Federal	0.0	0.0
State and Private	14.7	10.3
TOTAL	121.0	157.3

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	27.8	54.1
Other Federal	0.0	0.0
State and Private	1.1	0.4
TOTAL	28.9	54.5

TABLE 8.---*Status of fir engraver beetle infestations by state during 1994.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	1.4	0.5
Other Federal	0.0	0.0
State and Private	1.0	3.9
TOTAL	2.4	4.4

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	30.0	86.9
Other Federal	0.0	0.0
State and Private	2.2	2.6
TOTAL	32.2	89.5

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	34.3	85.0
Other Federal	0.0	0.0
State and Private	1.4	1.6
TOTAL	35.7	86.6

Wyoming

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.0	0.0
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.0	0.0

Figure 1.

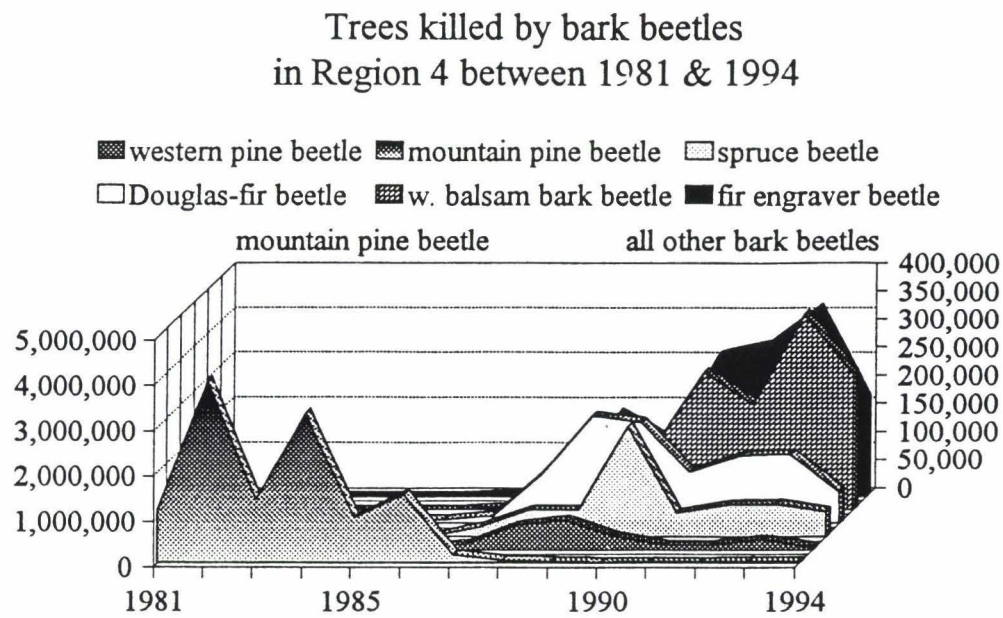


Figure 2.

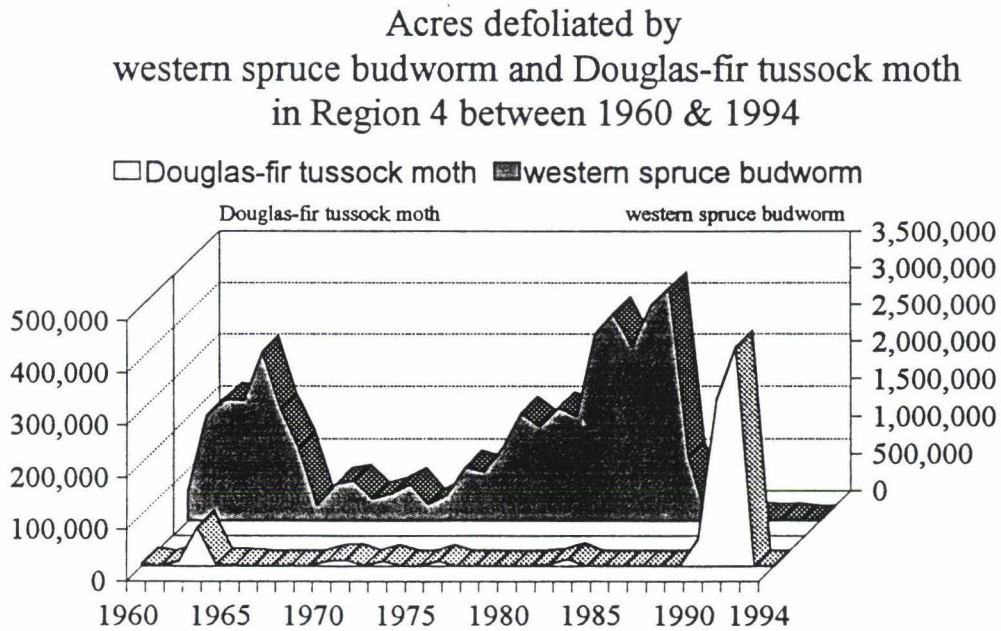


Figure 3. Areas infested by mountain pine beetle and Jeffrey pine beetle in Region 4 during 1994 as observed during aerial detection surveys.

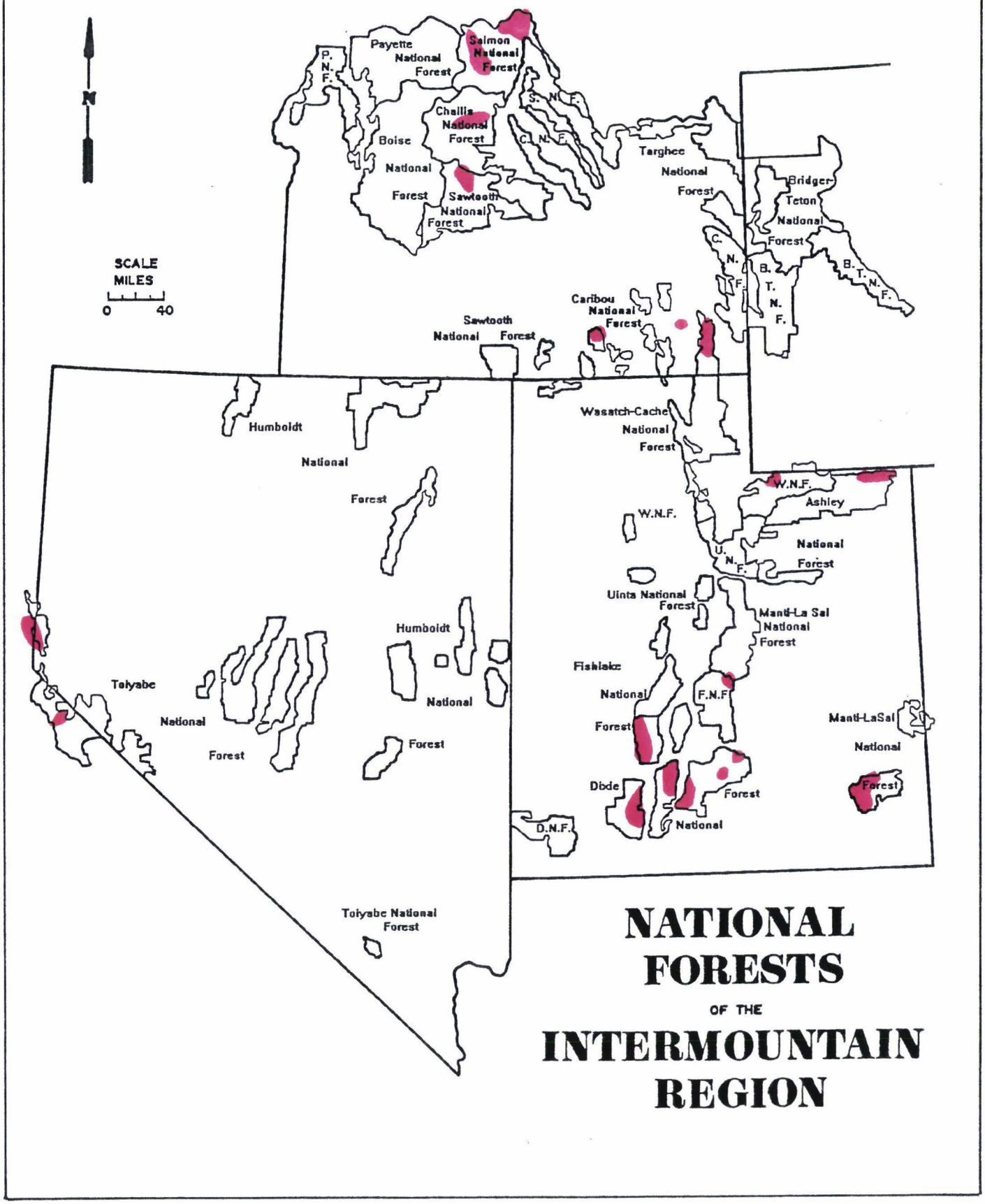


Figure 4. Areas infested by spruce beetle in Region 4 during 1994 as observed during aerial detection surveys.

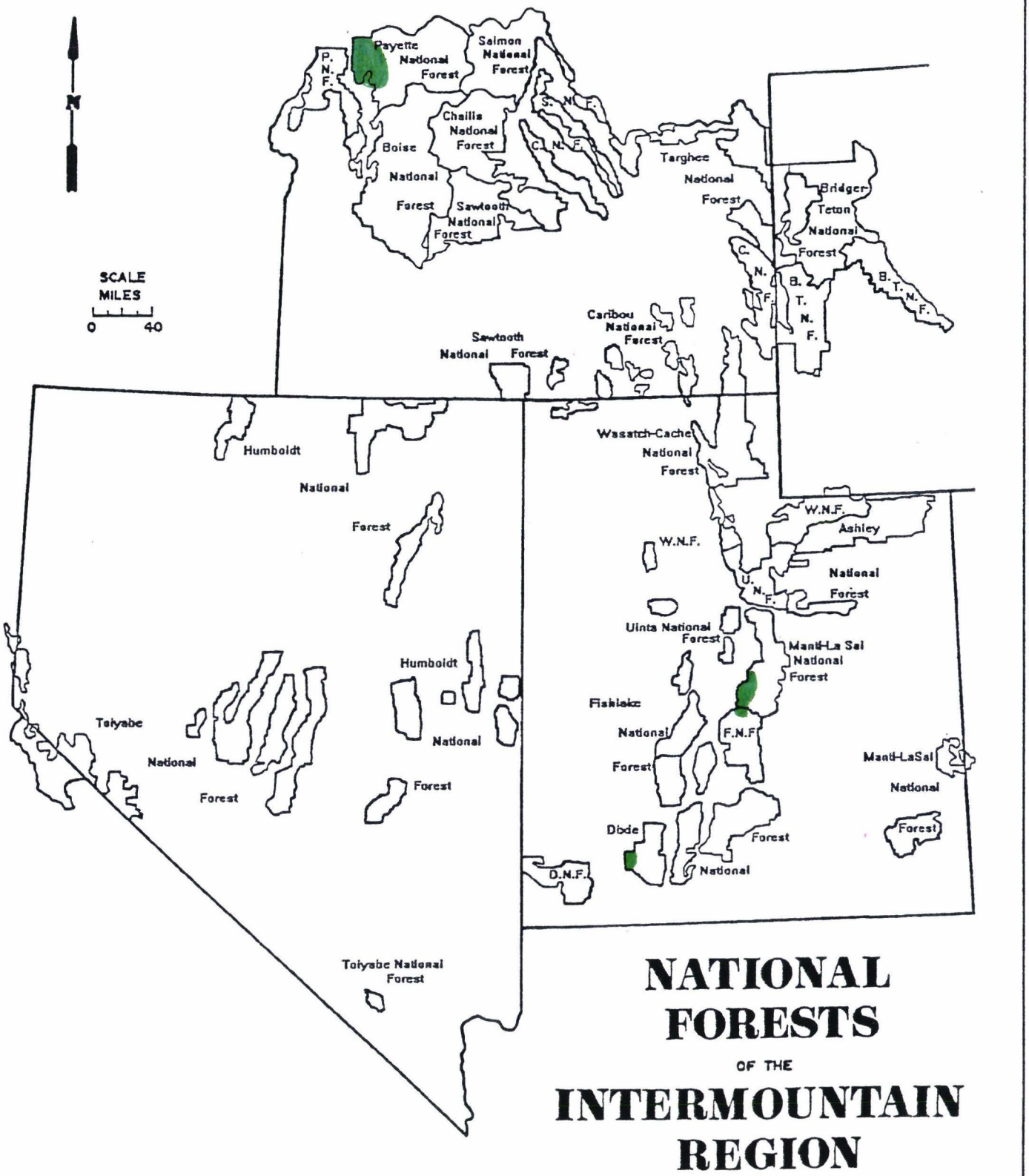


Figure 5. Areas infested by Douglas-fir beetle in Region 4 during 1994 as observed during aerial detection surveys.

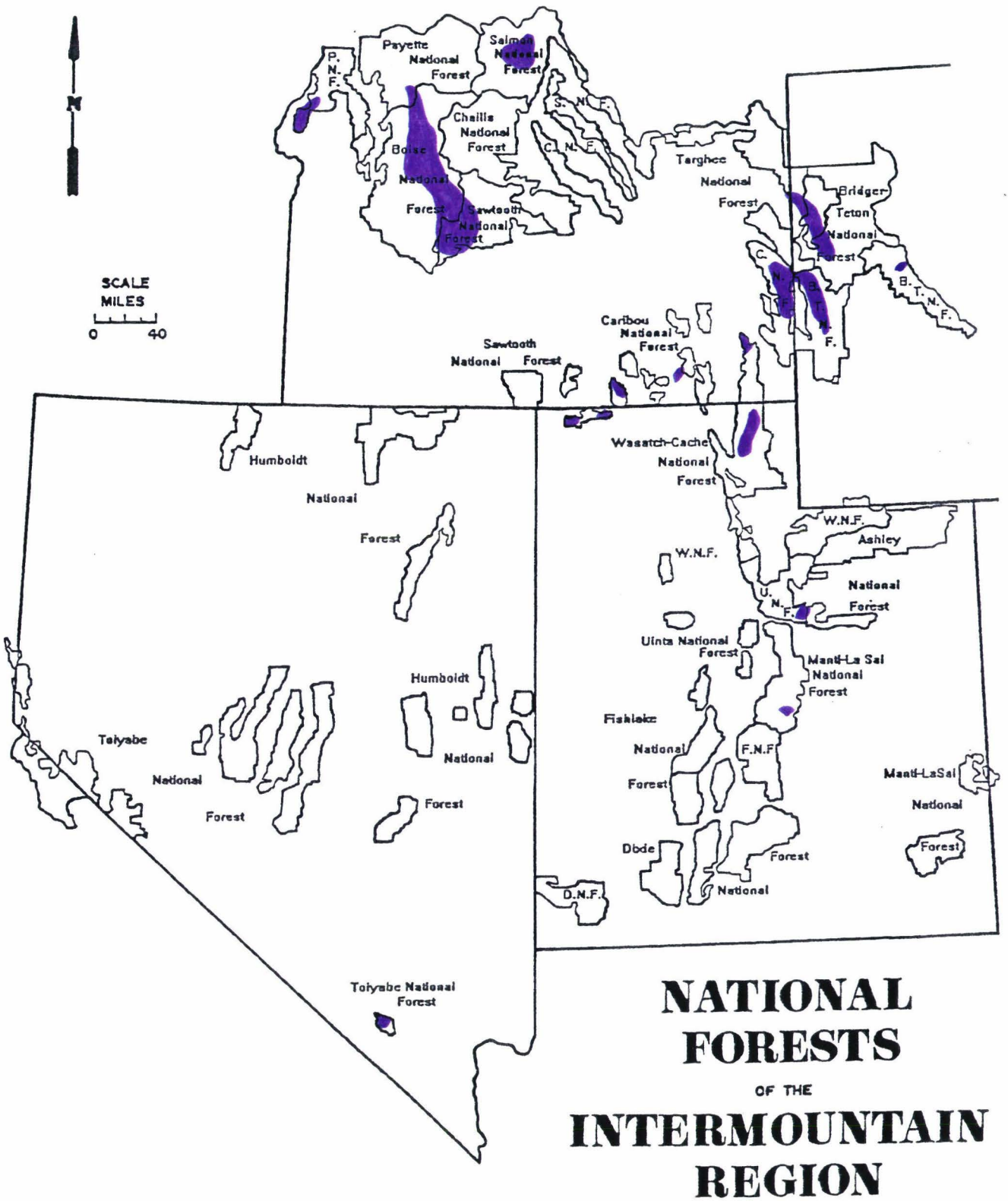


Figure 6. Areas infested by western pine beetle and *Ips* beetles in Region 4 during 1994 as observed during aerial detection surveys.

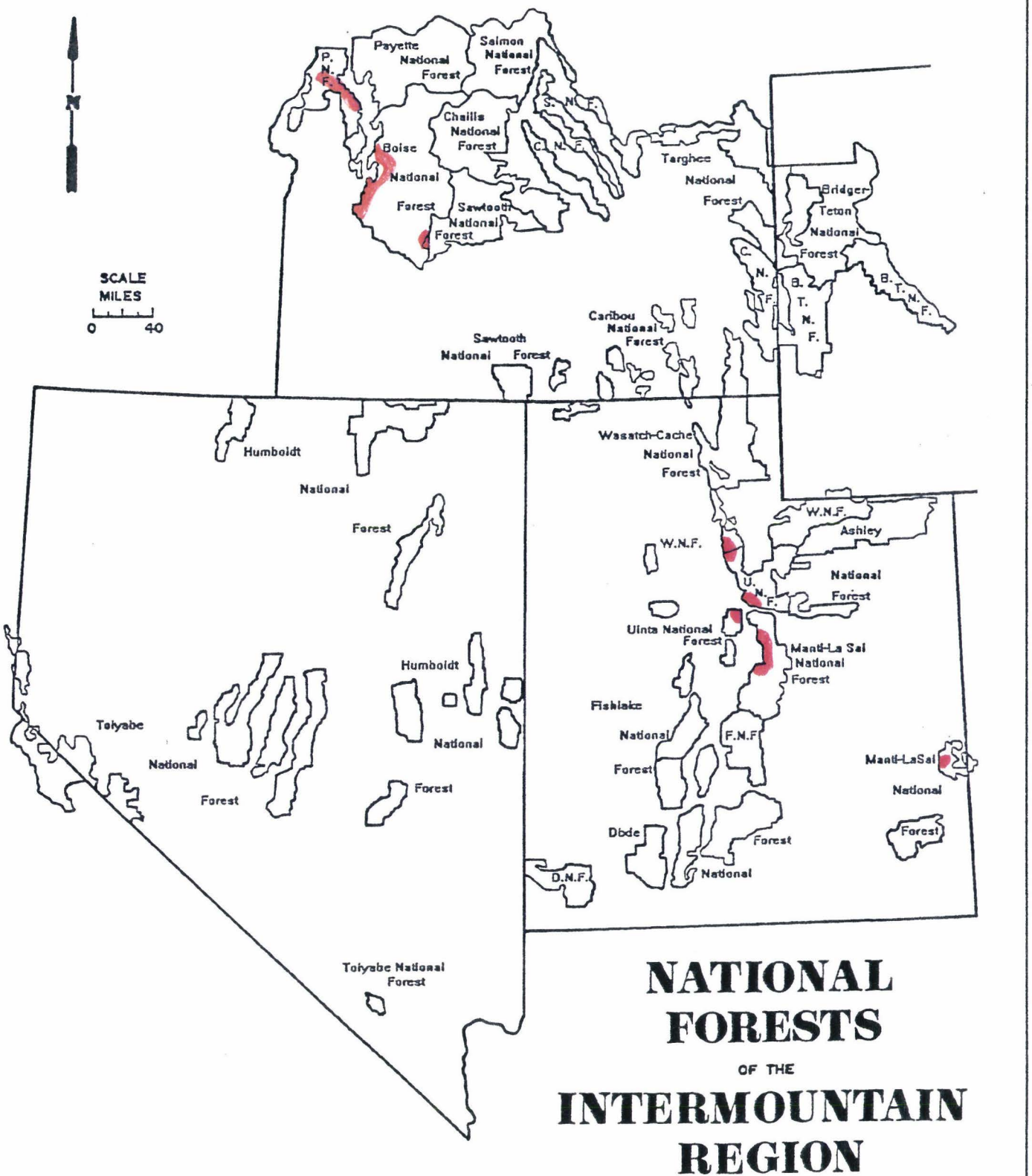
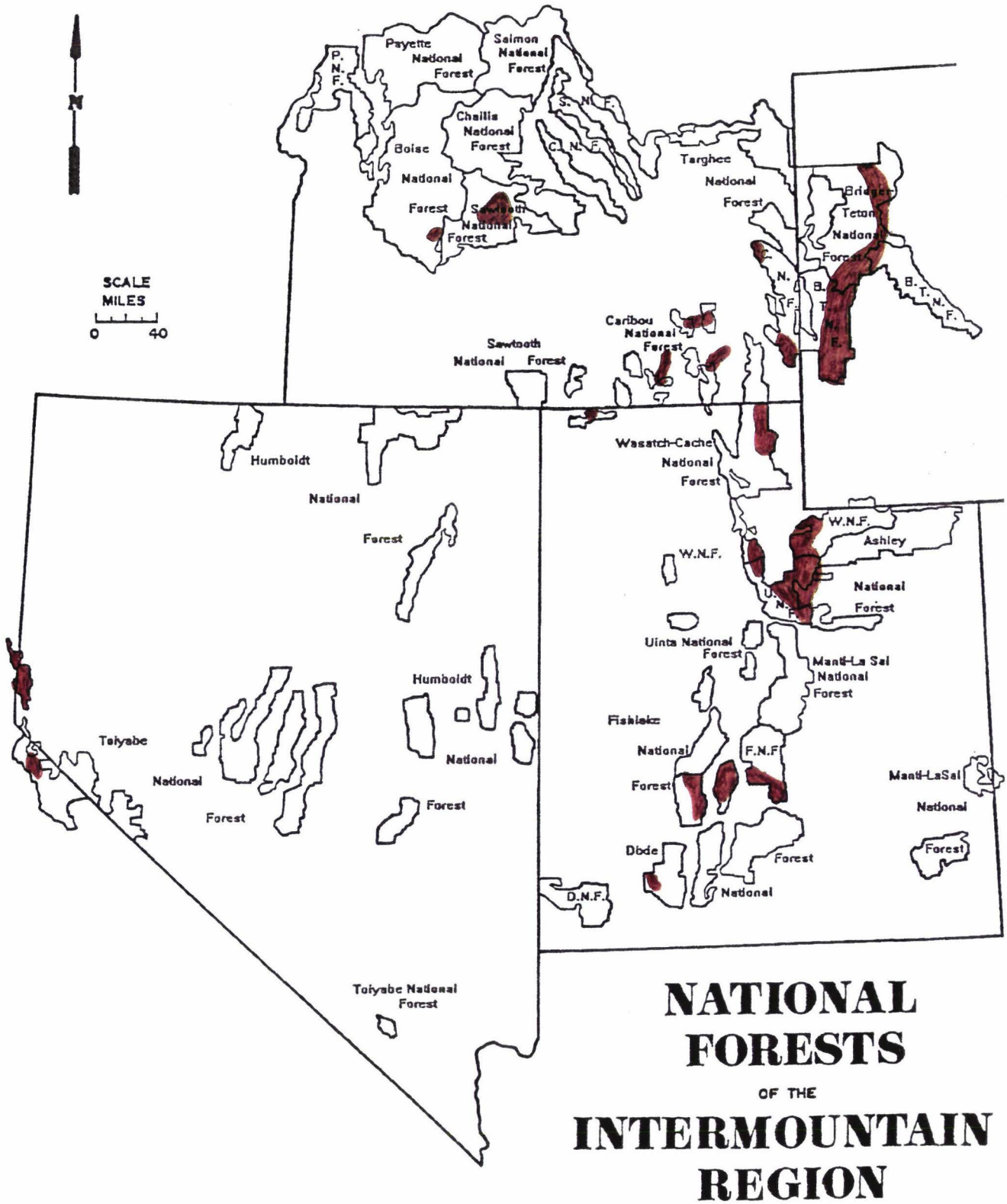


Figure 7. Areas infested by fir engraver beetle and western balsam bark beetle in Region 4 as observed during aerial detection surveys.



Western Pine Bark Beetle Impact Model. This model development project began in 1993 to produce a model which predicts the impacts of mountain pine beetle on ponderosa and lodgepole pine, western pine beetle and *Ips* in western forests. In late March 1994, the model was presented to cooperators. Validation and testing is currently being conducted with data from the Black Mountain Experimental Forest in CA. Contact: D. Hansen.

Alternatives to Methyl Bromide Fumigation - Inclusion of the Lucky Peak Forest Nursery in the West-Wide Research Effort. The USDA Forest Service nursery just outside Boise, Idaho was included in a west-wide, 5-year evaluation of alternative technologies for the management of soil-borne diseases and weeds in bareroot forest nurseries. The project evaluated the efficacy of different cultural regimes, including cover crops, soil amendments, and crop rotation schemes to reduce the impacts of pests on conifer seedlings. First year results indicate no significant differences in seedling density of ponderosa and lodgepole pines. The seedlings in the methyl bromide plots, however, appeared to be taller and of larger caliper. Contact: J. Hoffman.

Release and Capture of Sterile Gypsy Moth in Mountainous Terrain. Current trapping guidelines may not be sufficient for monitoring low density populations of gypsy moth in mountainous terrain. Utah uses grid densities with inter trap distances of 500, 1000, and 2000 feet. This study is evaluating the relationship between various inter trap distances and how effective current trapping strategies are for monitoring low density gypsy moth populations in mountainous terrain. Trap catch data will be associated with aspect, slope, temperature, relative humidity, wind speed and direction to determine what, if any relationships exist between trap catches and these variables. Field data was collected in 1993 and 1994 with data analysis to be completed by early 1995. Contact: C. Keyes, Utah State University, or J. Anhold.

Effects of Temperature and Relative Humidity on Gypsy Moth Pupae. This was the second year for this project to determine the effects of temperature and relative humidity on gypsy moth pupal survivability. Location within the stand canopy and aspect are associated with temperature and relative humidity differences in mountainous terrain. Preliminary studies conducted in 1993 suggest that the pupal stage may be adversely affected in low humidity environments. Contact: M. Quilter, Utah Department of Agriculture, or J. Anhold.

Threshold Impacts of B.t. on *Incisalia fotis*, a Sensitive Lepidoptera Species in Utah. *Fotis* larvae were exposed to various amounts of B.t. applied using a spray tower, to determine minimum threshold amounts of B.t. lethal to feeding larvae. This information will be incorporated into the FSCBG model to determine possible impacts of drift on feeding non-target larvae. Contact: W. Whaley, Utah Valley Community College, or J. Anhold.

Effectiveness of Carbaryl and Pyrethroid Insecticides for Protection of Engelmann Spruce from Attack by the Spruce Beetle. This study will evaluate the efficacy of pyrethroid insecticides and carbaryl as a preventative treatment for spruce beetle. A single application of two concentrations each of Sevimol, esfenvalerate (Asana XL), and cyfluthrin (Tempo II) were used. Application rates applied were: Sevimol at 0.025 and 0.05 percent, Tempo II at 0.008 and 0.025 percent, and Asana XL at 0.025 and 0.05 percent. Treatments were assigned at random to 192 trees. Each treatment consisted of 32 trees with an additional 64 trees used as untreated controls. All insecticides were applied in September ,1993 with hydraulic sprayers. Spruce beetle pheromone baits were placed in May of 1994 and will be placed again in May of 1995 to determine efficacy over a two year period. Contact: K. Johnson, Utah State University, or J. Anhold.

Implementing Data Visualization in Integrated Forest Planning. This project involves further development and expansion of the current capabilities of the SmartForest 3-D model in simulating forest growth and pest model interactions, and to transfer that technology to a field office for proof-of-concept testing. Contact: S. Munson.

Optimal Dose of MCH Bubble Capsules for Protecting Douglas-fir from Attack by the Douglas-fir Beetle. Three replicates of this study were installed in Utah and southern Idaho to complement others in Montana and eastern Oregon. The project compared two lower doses of MCH bubble capsules (20/ac and 40/ac) to the standard dose of 60/ac. Statistical analysis continues, but MCH treatments resulted in fewer infested trees compared to the untreated controls. Contact: S. Munson or R. Thier.

Site and Stand Factors Associated with the Occurrence of Douglas-fir Beetle in Douglas-fir. Objectives are: 1) to determine site and stand characteristics associated with Douglas-fir beetle infestation, 2) develop a hazard rating with predictions of expected mortality, and 3) test available hazard rating schemes. The project was undertaken cooperatively with Regions 1, 2, and Rocky Mountain Forest and Range Experiment Station. Field investigations are planned for 1994 and 1995. Contact: S. Munson or R. Thier.

MCH Bubble Capsules for Preventing Spruce Beetle Attacks. Six replicates consisting of a control and three doses of MCH bubble capsules (25/ac, 50/ac, and 75/ac) were established on the Manti-LaSal National Forest in central Utah. Blocks were installed in September of 1993 and bubble caps were placed the second week of June, 1994. Field analysis was conducted the week of September 19th, 1994. When the bubble caps were placed in June, adult beetles had already began to disperse. Data has been sent to the Pacific Southwest Forest Experiment Station for analysis. Contact: S. Munson.

Western Balsam Bark Beetle Anti-aggregant Study. Investigations proceed regarding the anti-aggregant properties of endo-brevicomin on the western balsam bark beetle. Traps placed in Big Cottonwood Canyon, UT in 1993 exhibited a marked reduction in beetle catch in the presence of endo-brevicomin. In 1994, endo-brevicomin was dispersed from bubble capsule releasers in a replicated experiment on the Wasatch National Forest in Utah. Two treatments, 20 caps/ac and 10 caps/ac were compared to an untreated experimental control plot. Preliminary results do not indicate any treatment effect. This is in contrast to a similar investigation in Canada where endo-brevicomin proved to be an effective anti-aggregant when applied at the rate of 40 caps/ac. Contact: S. Munson or A. Dymerski.

Western Balsam Bark Beetle Flight Period Study. This project now has three years of data. Lindgren funnel traps baited with exo-brevicomin were deployed in Big Cottonwood Canyon, Utah at elevations ranging from 6950 to 9500 feet. Trap contents were emptied twice weekly from May through October and insects were tallied by sex and species. Flight commenced within a few days of snow melt - usually early June - and continued into late September or early October. Western balsam bark beetles were trapped until negative catches were recorded for a two week period. Two peaks of flight activity were typically observed, though this was apparently influenced by the record weather extremes of each study year. The first and largest peak occurred within two weeks after adult dispersal began in June. A second peak occurred in August. The first peak was equally represented by both males and females while the second peak was dominated by females. Contact: S. Munson or A. Dymerski.

Russian Asian Gypsy Moth Monitoring Program. A Monitoring program was established in 1993 for Asian gypsy moth in Russia's far eastern ports of Vladivostok, Nahodka, and Vostochny. Project objectives are to develop procedures to determine when populations of this insect will reach outbreak levels, initiate suppression tactics to reduce ship infestations and establish a period of risk for vessels in affected ports. Data has been collected for *Lymantria dispar, L. monacha, and L. mathura.* !993 results were analyzed and GIS maps produced depicting trap locations and catches. 1994 results have recently been obtained and are being analyzed. A report of the 1993 and 1994 program results will be available by April, 1995. Contact: S. Munson.

Development of Aerial Video for Operational Use in FPM Programs. This multi-year technology development project to identify capabilities of and guidelines for the operational use of aerial video in detecting and monitoring a variety of pest activities has been completed. Ground surveys completed in 1994, showed that vegetative effects caused by bark beetles, root diseases, and Douglas-fir tussock moth could not be reliably identified on airborne video imagery at one-half or one mile swath widths. Reduced swath widths are recommended. A final report on this project is in press. Contact: T. Barbouletos.

Permanent Plots to Validate The Dwarf Mistletoe Extension of the Forest Vegetation Simulator(FVS). The purpose of this ongoing, west wide project is to establish a database to validate and calibrate the dwarf mistletoe model linked to the FVS. Eleven new permanent plots were established on three National Forests. Twenty-four plots were monitored on five National Forests. A database has been created by FPM-MAG to house data from all types of permanent plots. Contact: J. Guyon

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